

Title:	Evaluation and Management of Acute Ischemic Stroke: Endovascular Therapy
Number:	CSC-5
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Source

This protocol is adapted primarily from the American Heart Association/American Stroke Association guidelines statements on the treatment of acute ischemic stroke as most recently updated in 2015.

Treatment Goal

All eligible patients, based on the criteria below, should be offered treated with endovascular therapy as soon as possible.

Time Goals

- Door to groin puncture: < 90 minutes after arrival
- When the clinical situation allows, we will minimize time in the ED, taking patients directly from the transfer stretcher to the angiography suite after a brief stop in the ED to insure stability and to register

Inclusion Criteria (see also Appendix A)

- Diagnosis of acute ischemic stroke causing significantly disabling neurological deficit, NIHSS ≥ 6 . (Patients with severe deficits (complete hemianopsia, severe aphasia, severe weakness of a single limb) but NIHSS < 6 will be considered for appropriateness of endovascular therapy on an individual basis.)
- Onset of symptoms < 24 hours before groin puncture (Patients who arrive too late to meet this time goal should be screened for active clinical trials of endovascular therapy and enrolled, if eligible.)
- Age ≥ 18 years
- Pre-stroke Modified Rankin Scale ≤ 3
- Imaging evidence of a small core lesion, accessible large artery occlusion (carotid, M1, M2, VA, BA)

Exclusion Criteria

- Pre-stroke mRS > 3

- Large core infarct on initial head CT, ASPECTS < 5
- Large core infarct on MRI, DWI > 100 cc
- CT or MRI showing alternative diagnosis
- Technically inaccessible occlusion, based on angiographer's assessment of vascular imaging
- For those in the 6-24 hour window, lack of DAWN clinical deficit:core volume mismatch, or when using MRP or CTP for selection, lack of DEFUSE 3 PWI:DWI mismatch on MRP or PWI:Tmax mismatch, respectively. (See *Appendix A* for DAWN and DEFUSE definitions.)

Pregnancy

- Pregnancy is not a reason for exclusion, and pregnant women should be evaluated as all other patients with the following added considerations:
- Radiation exposure to the fetus should be minimized by proper shielding of the pelvis
- Gadolinium should not be given
- Iodinated CT contrast should be minimized
- The obstetrics team should be consulted for advice and to arrange for fetal monitoring during the procedure

Pre-Treatment Evaluation

- Temperature, pulse, BP, respirations
- Physical exam / neurologic exam with NIHSS
- EKG
- CBC with platelets, basic metabolic panel, LFTs, INR, aPTT (*Treatment may begin before laboratory studies have returned.*)
- Urine HCG in women of child-bearing potential
- Head CT (In most cases, we will perform a head CT with stroke-protocol CTA of the head and neck before, however, especially for patients arriving after Telestroke evaluation having had head CT at the initial hospital, we will in many case proceed as rapidly as possible to the angiography suite and perform a DynaCT on the angiography table for pre-procedure screening.)

Pre-Treatment Management BP

- If patients have received IV tPA before the procedure, then the BP should be maintained below 180/105, according to the protocol of IV tPA (see *Clinical Protocol: Evaluation and Management of Acute Ischemic Stroke: IV tPA, Appendix B*)
- If no IV tPA has been given, then the BP can be allowed to autoregulate in the higher range; phenylephrine may be used to augment sBP below 160, based on the discretion of the treating team
- The choice of treatment with conscious sedation versus general anesthesia will be made by the angiographer in collaboration with the treating neurologist

Post-Procedure Management

- Post procedure BP goals will be set by the treating team, based on the status of the vessels and other considerations; for patients who have received IV tPA, BP should not exceed levels recommended in the IV tPA protocol; for patients whose procedures achieved full (TICI 3) reperfusion, it is reasonable to set a low upper limit for BP; this is true especially for patients whose procedure included urgent angioplasty or stenting of a

- chronically stenotic internal carotid artery placing them at higher risk for reperfusion hemorrhage.
- Obtain a head CT after arrival in the NICU
 - The leg of the canalized artery will be splinted for immobilization after the procedure.
 - In most cases the femoral sheath will have been removed and the artery closed by AngioSeal before transfer to the NICU. In this case, maintain the splint for immobilization for 4-6 hours after the procedure.
 - If the sheath remains in place, contact the angiography team to coordinate management of anticoagulants and removal of the sheath.
 - In all cases, monitor the leg for adequate pulses, capillary filling, color, and temperature to insure good perfusion
 - In all cases, monitor the groin site for bleeding and for a palpable mass suggesting pseudoaneurysm at the puncture site; if pseudoaneurysm is suspected, the artery should be examined by ultrasound
 - For uncontrolled bleeding or for a demonstrated pseudoaneurysm, consult Vascular Surgery for definitive management

Management of intracranial hemorrhage after endovascular therapy

- For symptomatic hemorrhage after endovascular therapy follow the protocol for hemorrhage after IV tPA, if tPA was given (see *Clinical Protocol: Evaluation and Management of Acute Ischemic Stroke: IV tPA, Appendix C*)
- For patients with hyperdensity on the post-procedure head CT that does not clearly distinguish between hemorrhage and extravasated contrast staining, perform a follow-up CT in approximately 6 hours, or earlier, if the patient's condition deteriorates.

References

- Powers WJ, et al. 2015 AHA/ASA focused update of the 2013 guidelines for the early management of patients with acute ischemic stroke regarding endovascular treatment: A guideline for healthcare professionals from the American Heart Association/American Stroke Association. *Stroke* 2015; 46:3020-35.
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- Razmara, et al. Cerebrovascular complications of pregnancy and the postpartum period. *Curr Cardiol Rep* 2014; 16:532.
- Power WJ, et al. 2018 Guidelines for the early treatment of patients with acute ischemic stroke: A guideline for healthcare professionals from the American Heart Association/American Stroke Association. *Stroke* 2018;49:e46-e110.
- Nogueira RG, et al. Thrombectomy 6- to 24 hours after stroke with a mismatch between deficit and infarct. *N Engl J Med* 2018;378:11-21.
- Albers GW, et al. Thrombectomy for stroke at 6 to 16 hours with selection by perfusion imaging. *N Engl J Med* 2018;378:708-18.

Appendix A: Screening Criteria for Selection of Patients for Endovascular Therapy

Source

This protocol was created in collaboration with the Stroke Division of MGH Neurology, based on American Heart Association/American Stroke Association guidelines statements on the treatment of acute ischemic stroke.

Treatment Goal

Eligibility for endovascular therapy for acute ischemic stroke has been shown to be effective for properly selected patients in several clinical trials, and it is still under study. This protocol is designed to optimize selection of patients for this therapy.

For ALL patients with NIHSS ≥ 6 and LSW < 24 hrs, assess the following:

Clinical

- NIHSS
- Time from LSW to expected groin puncture
- Age
- Premorbid baseline mRS (and dementia) and life expectancy
- Candidacy for IV tPA

Radiological

- Hemorrhage excluded
- Evidence of ischemic stroke
- Presence of LVO (ICA, M1, M2, or BA)
- Core infarct volume (ASPECTS or DWI)
- Quality of collaterals

Using the above screening data, classify patients as proven, uncertain, or unlikely to benefit from endovascular ischemic stroke therapy.

Evaluate for possible enrollment in clinical trials.

Pagers: Stroke Fellow

- BWH 31382
- MGH 21723

Pagers: Interventional Neuroradiology Fellow

- BWH 26457
- MGH 33722

PROVEN BENEFIT

Treatment process for all cases initiated by stroke and endovascular fellows

Clinical (must meet all)

- NIHSS ≥ 6
- Time from LSW to expected groin puncture ≤ 6 hours
- Age 18-85 years
- Time from LSW to expected groin puncture 6-24 hours who fulfill DAWN or DEFUSE 3 criteria*
- Premorbid condition
 - mRS ≤ 1
 - Life expectancy > 12 months

Radiological (must meet all)

- Minimal hemorrhage
- Intracranial ICA or MCA M1 occlusion
- Small established infarct core volume by either imaging modality
 - If by CT:
 - ASPECTS ≥ 6 on NCCT
 - Symmetric collaterals on CTA
 - If by MRI:
 - ≤ 70 cc DWI by ABC/2 measurement
- In 6-24-hour window fulfilling DAWN or DEFUSE 3 criteria*

UNCERTAIN BENEFIT

Treatment only if both stroke and endovascular attendings agree

Clinical (must meet all. Ensure patient is NOT in the proven to benefit group)

- NIHSS ≥ 4
- Time from LSW to expected groin puncture > 24 hours
- Age < 18 or > 85 years
- Premorbid condition
 - mRS ≤ 3
 - Life expectancy judged to be adequate

Radiological

- Minimal hemorrhage
- Anterior circulation
 - Intracranial ICA or MCA M1 or M2, or ACA occlusion
 - Small established infarct core volume by either imaging modality
 - If by CT:
 - ASPECTS ≥ 5 on NCCT
 - Symmetric collaterals on CTA
 - If by MRI:
 - ≤ 100 cc DWI by ABC/2 measurement
- Posterior circulation
 - Proximal arterial occlusion of the basilar or dominant vertebral artery
 - $\leq 50\%$ infarction of the pons, midbrain, or thalamus

- In 6-24-hour window with ASPECT score < 6 , or core volume > 70 cc, or unclear mismatch (< 15 cc; ratio < 1.8)

* DAWN Criteria

- Large Vessel Occlusion: ICA or MCA stem
- Mismatch groups:
 - ≥ 80 : NIHSS ≥ 10 and core volume < 21 cc
 - < 80 : NIHSS ≥ 10 and core volume < 31 cc
 - < 80 : NIHSS ≥ 20 and core volume < 51 cc

*DEFUSE 3 Criteria

- ASPECTS ≥ 6
- Core volume < 70 cc
- Mismatch ratio ≥ 1.8 (perfusion volume/core volume)
- Absolute volume at risk ≥ 15 cc

UNLIKELY BENEFIT

No endovascular treatment offered

Clinical (if meets any)

- NIHSS < 4
- Time from LSW to expected groin puncture >24 hours with large core volume (see below)
- Premorbid condition
 - mRS \geq 4
 - Major medical co-morbidity
 - Life expectancy judged to be limited

Radiological

- Large hemorrhage
- Anterior circulation
 - Distal arterial occlusion (M3, M4, A2)
 - Large established infarct core volume by either imaging modality
 - If by CT:
 - ASPECTS \leq 4 on NCCT, or
 - Malignant collateral pattern
 - If by MRI:
 - > 100 cc DWI by ABC/2 measurement
- Posterior circulation
 - Distal arterial occlusion (e.g. isolated PCA)
 - > 50% infarction of the pons, midbrain, or thalamus